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To what extent are veterinary practices prepared to treat wildlife patients? A cross-sectional study of perceptions of responsibility and capability of treating wildlife in UK veterinary practices

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Abstract

Attribution of responsibility for wildlife is ambiguous, which can be problematic for those inextricably associated with wildlife care and managing decision-making processes, including veterinary professionals within general practice. Large numbers of wildlife casualties are frequently presented to veterinary practices. But there are few published data detailing this demand, the ability to respond to this demand, the attitudes towards this role and any benefits or disadvantages associated. This paper adopts a cross-sectional design involving a semi-quantitative online questionnaire to develop understanding of the interface between veterinary practices and wildlife casualty management. The questionnaire was distributed to 1,706 veterinary practices in the UK. Veterinary surgeons and veterinary nurses returned a total of 180 questionnaires (11% response rate). The findings revealed that most veterinary practices were willing to treat wildlife patients (85%) and the numbers treated were substantially higher than previous estimates. Data were analysed using non-parametric statistical techniques. There was a significant correlation between total numbers of wildlife treated in veterinary practices and their 'total knowledge' ($p < 0.001$) and facilities ($p < 0.001$). There was a significant correlation between practices that perceived treating wildlife benefitted the practice overall and total numbers treated ($p = 0.016$). Recurrent benefit themes included experience, knowledge, personal satisfaction, team morale and public relations. The findings suggest the capability of veterinary practices to treat wildlife casualties would improve with additional financial support and dissemination of information on wildlife rehabilitation and outcomes within the veterinary community. Further research is needed to enhance generalizability of these findings to the population.

Key words: attitudes, capability, responsibility, treatment, United Kingdom, veterinary practice, wildlife casualty.

Introduction

Treating wildlife casualties is a multi-faceted issue involving important scientific, ethical, economic and political dimensions. Over the past 20 years, intervention for the treatment and rehabilitation of distressed or sick and injured wild vertebrates has become widespread (Mullineaux 2014) and there is evidence to suggest it is being undertaken on an increasingly large scale in the UK (Kirkwood 2000; Molony et al. 2007; Grogan and Kelly 2013). This is due in part to growing public awareness and concern about anthropogenic causes of wildlife casualties (Kirkwood 2000) and partly to advances in wildlife medicine and the wider availability of reference material and resources, particularly over the past 10 years (Cracknell 2015).

Assessing the extent of UK wildlife casualties, from admissions to (potential) integration of the animal back into the wild, is complicated. There is no central database of the people involved in the process or the animals being treated. Some attempts have been made to collate information, that have produced estimates of 30 to 40,000 wildlife casualties seen per annum (Molony et al. 2007) and a minimum of 71,000 animals per annum (Grogan and Kelly 2013) using actual figures of admissions to UK wildlife rescue centres during 2011.

These studies did not attempt to break down the figures by species. Of the 71,000 animals mentioned over 20% (16,639) were admitted to Royal Society for the Prevention of Cruelty to Animals (RSPCA) centres, and detailed information is recorded on each admission (Grogan and Kelly 2013), but it is not systematically published. Some work has been done on those data, but it is species-specific. For example, the RSPCA commissioned the University of Bristol to carry out an analysis of release rates on 8 species of animal admitted to its centres between 2000 and 2004 (Grogan and Kelly 2013). Other papers focus on the treatment of particular cases, or of a single species at a particular site: for example, sparrowhawks (Kelly and Bland 2006) and woodpigeons (Kelly et al. 2011) at Stapeley Grange.

There has not been a systematic review of wildlife seen by veterinary professionals. Veterinary intervention is often essential in the early part of the rehabilitation process and practices are frequently presented with wildlife casualties (Mullineaux et al. 2003; Varga et al. 2012). Some of these animals are later passed onto the RSPCA or other rescue centres, and may therefore be included in the surveys mentioned. But others are not, and they are not included in the survey estimates.

Veterinary practices play a vital role in dealing with injured wildlife, and are often the first point of contact, but there is a paucity of research regarding the demands this places on UK veterinary practices, their attitude towards this role or their capacity to contribute to this particular aspect of wildlife management.

Defining responsibility and capability

There is international appreciation of the need to treat wildlife casualties correctly and educate those involved in their care (Vogelnest 2008; Miller 2012). However, no government department or conservation body in the UK accepts full responsibility for wildlife health, and responsibility for wildlife casualties and the issues surrounding them are often unclear (Duff et al. 2010).

Veterinary professionals are subject to legislation including the Wildlife and Countryside Act 1981, the Animal Welfare Act 2006, some species-specific legislation (e.g., Protection of Badgers Act 1992, Deer Act 1991) and the Veterinary

Surgeons Act 1966. The regulatory requirement to 'take steps to provide 24-hour emergency first aid and pain relief to animals according to their skills and the specific situation' is stated in the Royal College of Veterinary Surgeons (RCVS) Codes of Professional Conduct (RCVS 2012:1.4). There is also a wider ethical responsibility in treating wildlife casualties and acute ethical dilemmas have been widely considered in the literature (Kirkwood 2000; McCallum and Hocking 2005; Cooper and Cooper 2006). In particular, the decision whether to treat or to euthanase is often difficult. Wild animals are likely to be particularly stressed by being held for treatment, especially if they are held in proximity to domestic animals (Stocker 2005). Moreover, there may be little point in subjecting patients to the stress of treatment (and practices to the cost) unless there is a good prospect of successful release into the wild. That depends not only on the patient and its injury, but also upon the resources available within or to the veterinary practice. The veterinary practice considering such dilemmas also has to negotiate a tangle of legal restrictions on holding or releasing different species.

The public expects that the welfare of wildlife, including the impact of disease, should be monitored (Kirkwood and Sainsbury 1996). Veterinary practices have a role in wildlife disease surveillance (Duff et al. 2010). This includes legal obligations to report notifiable zoonotic diseases such as brucellosis and tuberculosis to the Animal and Plant Health Agency (APHA). There are no formal systems to report other diseases, although the investigation of the cause of clinical illness may be useful to identify pathogens not previously described in that species (Mullineaux 2014). Such information, or indeed any wildlife experiences, could be shared by veterinary practices through professional journals or elsewhere within the veterinary community and facilitate wildlife education.

Practical implications, challenges and opportunities

The public's perception in the UK is that veterinary practices are both willing and able to deal with wildlife (Cooper and Cooper 2006). Wildlife casualties are often brought to the practice by the public (who may or may not have called the practice in advance) and the advice to take injured wildlife to a local veterinary practice is encouraged by influential sources such as the RSPCA (n.d.), Royal Society for the Protection of Birds (RSPB 2013) and the British Broadcasting Corporation (BBC 2013). This means that a veterinary practice of any size or type may be faced with an unpredictable wildlife caseload. Wildlife can also be presented to veterinary practices by wildlife rescue centres and local authorities (Mullineaux 2014).

This demand, and the ethical and legal obligations regarding wildlife, can impose significant cost on veterinary practices. Diagnosis and treatment of wildlife casualties can be time-consuming and expensive (Sikarskie 1992). The financial costs of meeting the requirement to provide initial emergency treatment to wildlife casualties (over 1kg) can be met in part by the RSPCA under a Memorandum of Understanding (MoU) with the British Veterinary Association (BVA), but the veterinary practice must organise funding for any further treatment.

Veterinary practices treating wildlife casualties must have suitably trained staff with knowledge of the ecology, biology and specific problems encountered by the various wildlife species as well as their associated husbandry and handling (Mullineaux et al. 2003). Skills and experience with wildlife casualties will vary between and within practices (as could the number of available staff and time). Veterinary practices will

also need suitable facilities and equipment to treat the casualties. Most of the medical and surgical equipment required for wildlife patients is already available in veterinary practices that treat domestic species (Bewig and Mitchell 2009). However not all veterinary practices will have suitable housing for the range of wildlife presented or a suitable layout to permit quarantine and isolation areas. Wildlife casualties are potential sources of zoonotic diseases and the risk of disease transmission also extends to domestic species within the veterinary practice (Best and Mullineaux 2003). In addition, specialist equipment may be needed, such as puncture-proof gloves for safe handling of bats (Bexton and Couper 2010). Organisations must balance wildlife care with the other needs of the veterinary practice.

Every veterinary practice should have a wildlife triage protocol and early triage is recommended (Harvey 2010; Mullineaux 2014). When euthanasia is not clearly indicated, veterinary practices will generally hand over the process of rehabilitation and release to others (Mullineaux et al. 2003), implying veterinary practices need contact information for local rehabilitators and wildlife rescue centres. Formulating standard operating procedures (SOPs) can assist with triage and organising further treatment. A properly constructed SOP can improve animal welfare, efficiency and act as a training manual for staff (Gunn 2000; Yeates 2013).

There is limited peer-reviewed literature on measuring the benefits to veterinary practices in providing veterinary services to wildlife casualties. Secondary sources indicate that it may contribute to personal or professional satisfaction and generate secondary public relations benefits (Cooper and Cooper 2006). Yet as part of a conservation management strategy, it has been suggested that unless the patient is from an endangered species, rehabilitation will have little, if any, significant conservation value at a population level (Aitkin 1997; Molony et al. 2007). Detrimental effects can include disease transmission from rehabilitated animals to wild populations (Seddon 2012) and release of rehabilitated invasive species, such as the grey squirrel (*Sciurus carolinensis*) in the UK (Gurnell et al. 2006). Several authors choose instead to focus at the individual level, concluding that success can be primarily measured in optimising the short and long-term welfare of the individual wildlife casualty (Kirkwood 2003; Stocker 2005; Cooper and Cooper 2006). Veterinary practices may be well placed to judge short-term welfare (the likely success of the immediate treatment), but may have little basis for judging longer-term prospects of successful rehabilitation and post-release survival once patients are transferred or released. While there is some encouraging data on the short-term post-release survival rates of frequently rehabilitated wildlife casualties admitted to the RSPCA, such as bats (Kelly et al. 2012) and owls (Griffiths et al. 2010), post-release monitoring of all wildlife is unrealistic and their fate is generally undetermined.

Aims and objectives

To investigate the veterinary treatment of wildlife casualties and perceptions of responsibility and capability associated, as viewed by veterinary surgeons and veterinary nurses working in UK veterinary practices.

The study objectives included the following:

- To evaluate the demand for wildlife casualty services from veterinary practices.
- To evaluate the willingness and ability of veterinary practices to respond to that demand.
- To evaluate how demand, willingness and ability to respond correlate with practice-based variables.

Methods

This cross-sectional study used a self-administered semi-quantitative online questionnaire distributed to veterinary practices in the UK. Ethical approval to conduct the study was granted by Plymouth University's Ethics and Welfare Committee.

Sample and sample selection

The RCVS maintains a national database of registered veterinary practice premises. There were 5,125 registered veterinary practices in the UK at the time of research. The RCVS provided a list of 2,034 that had agreed to third party disclosure. Due to time constraints, it was not possible to follow up all invalid email addresses or telephone numbers and, as a result, the questionnaire was distributed to a total of 1,706 practices**.**

Data collection

Data was collected over 12 weeks between 19 October 2015 and 17 January 2016. Participation was requested by emailing an invitation (Appendix A) and link to the questionnaire URL using SurveyMonkey® to qualified veterinary surgeons and veterinary nurses (registered with the RCVS) working in the selected practices. This email provided information on the study's aim and details of the participation involved. The opening page of the questionnaire incorporated a consent agreement which included the assurance of anonymity for the respondent.

A number of strategies were used to increase response rates to the questionnaire, including an incentive of a prize draw to win a £50 multi-store gift voucher. Two reminders accompanied by another questionnaire link were emailed at 7 weeks and 11 weeks after the initial contact. A random selection of practices (chosen by systematic sampling) were telephoned before the reminders were sent to encourage participation.

Questionnaire design

A three-part questionnaire (Appendix B) was developed from a review of the literature on wildlife casualties and iterative content-validity procedures similar to those described by Patrick et al. (2011). The first part of the questionnaire contained 6 questions regarding the veterinary practice's type, size (number of staff), location and ownership. The next part of the survey asked 13 questions pertaining to the experience of the practice in relation to wildlife casualties: demand, caseload, protocols, knowledge, facilities and limitations. The questionnaire offered multiple choice answers and/or drop-down boxes to make it easier to complete the questionnaire and to facilitate later analysis of the data. Where appropriate, the questionnaire had additional free text boxes inviting respondents to explain their answer.

The final part of the questionnaire considered the opinions of the respondent. One question set out 12 statements of attitudes and experiences relating to wildlife in veterinary practice. Respondents were asked to rate the extent to which they agreed or disagreed with the statements, using a 6-point Likert scale.

The remaining three questions in this part were essentially open ended, asking the respondent's opinions on any benefits or disadvantages of treating wildlife casualties at their veterinary practice, and offered the opportunity to express additional comments/opinions they might have about the issues raised in the questionnaire.

Data analysis

Data was analysed using the Statistical Package for Social Sciences® (SPSS®) Version 22.0 (International Business Machines [IBM] Corporation, Armonk, NY). Non-parametric Kendall's Tau, Kruskal-Wallis/Jonckheere and Mann-Whitney tests were used to assess correlations. Because most of the data was not normally distributed, bootstrapping was used to obtain bias corrected and adjusted confidence intervals (BCa CI), but *p* values are still reported. Significance is reported as 95% BCa CI, $p < 0.05$. Categorical data was summarised using frequency and percentage (%).

Results

Of the 1,706 questionnaires distributed, a total of 180 (11%) were returned. Eleven were excluded (6%) due to absence of consent or response after consent, so a total of 169 (10%) questionnaires were available for analysis. Of these, 135 (80%) were complete and 34 (20%) partially complete. In the analysis below not all totals add to 169 (100%) as not all respondents answered all questions. Demographics of the sample are presented in Table 1.

Table 1. Characteristics of respondent practices. Total responses = 169.

Demographic characteristics	Frequency	%
Job role		
Veterinary Surgeon	80	47.3
Veterinary Nurse	88	52.1
Practice type		
First Opinion	125	74
Referral	3	1.8
After-hours emergency	0	0
> = 2 of the above	41	24.3
Prime species type		
Other[1]	1	0.6
Large Animal[b]	4	2.4
Mixed Animal	28	16.6
Small Animal	135	79.9
Location		
Urban	55	32.5
Semi-urban	46	27.2
Rural	20	11.8
Semi-rural	48	28.4
Ownership		
Private	127	75.1
Corporate	40	23.7
Time established		
>21 years	93	55
10-20 years	44	26
4-9 years	13	7.7
1-4 years	16	9.5
<1 year	1	0.6

[1] Wildlife hospital. [b] Includes both farm and equine.

The median number of staff in each practice was 4 (range 1-35) veterinary surgeons and 3 (range 1-60) veterinary nurses. The larger ranges were mainly attributable to 3 referral practices and 1 first opinion, small animal practice (which may have given multi-branch figures). There was a significant relationship between the total number of animals treated per practice and the number of vets ($\tau = 0.200$, 95% BCa CI [0.074, 0.304], $p = 0.001$), or nurses ($\tau = 0.214$, 95% BCa CI [0.093, 0.325], $p < 0.001$). Of practices receiving wildlife casualties, nearly all reported presentation by

he general public (96.4%). Other major sources included presentations by wildlife charities (39.1%) and local authorities (26.6%).

Demand and caseload

Both enquiries about wildlife casualties and admissions for treatment were experienced by 85% (143/169) of practices. In the following analysis, we have focussed on the numbers treated. For each species respondents were offered a dropdown box with increments varying from 5 to 10. To calculate total numbers treated, the mid-point of each interval was taken and the range 150+ was taken as 150. This gave a total of 8,081 animals treated, the distribution of species is given in Figure 2. Taking the low point and high point of each interval gave a total treated range of 6,267-9,895.

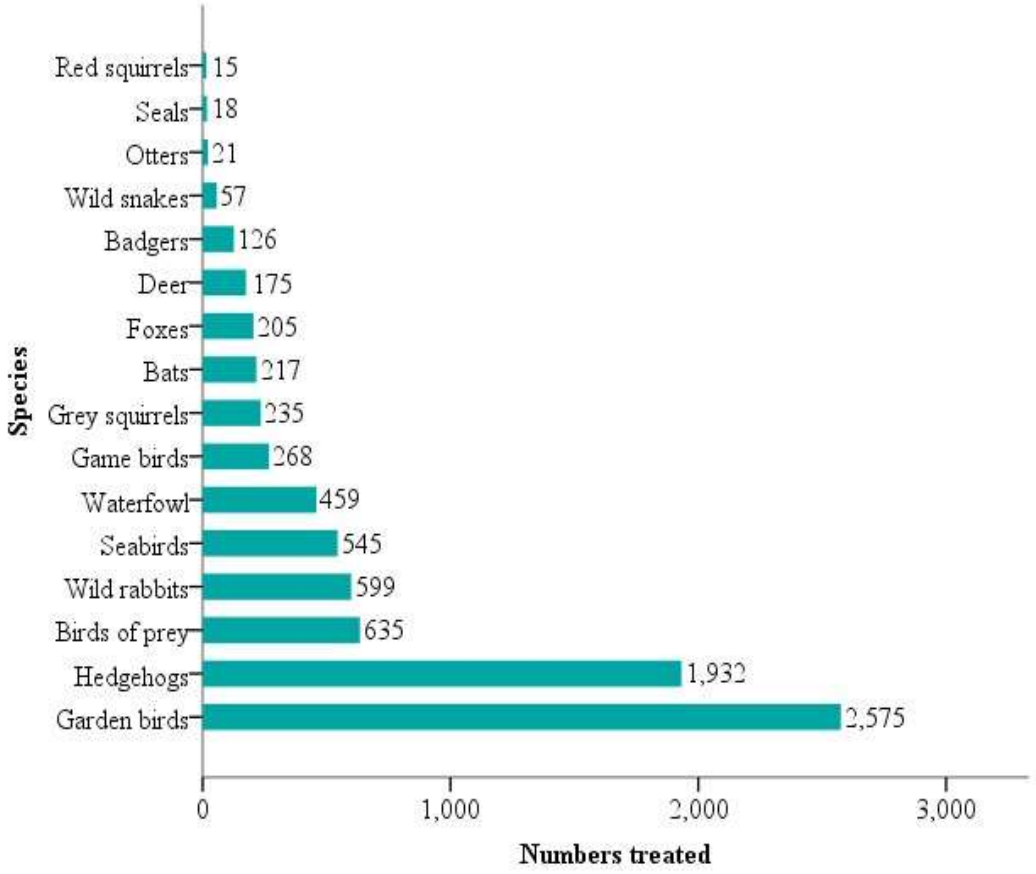

Figure 2. Estimated numbers of animals treated per species, per annum. Estimated values taken from the mid-point of each interval. Total animals treated = 8,081. Other species identified (with no numbers) included stoats and weasels.

Extrapolating these figures to the UK population of veterinary practices, 4,356 (85%) of the 5,125 practices would treat wildlife casualties. Using the average number of animals treated as 56.5 per practice per annum (8,081/143) gives an approximation of 246,160 wildlife casualties treated annually by veterinary practices in the UK. This figure is significantly higher than previous national estimates. However, the data is highly skewed by extreme values: the median 'total treated' per annum was 33, while the maximum was 355. On examination of the data, it appeared that those treating

>40 of any species (*n* = 20) had other characteristics that suggested they were either answering for multiple branches, or were specialists (treating high numbers of a particular species). Excluding these for the purposes of extrapolating a UK workload resulted in an average number of animals treated as 30.2 which would suggest a UK annual wildlife workload of 131,609 (range 90,044-173,173).

Injuries from predators and collisions were the most frequent causes of wildlife casualties with 55.1% and 47.1% of practices respectively reporting they experienced them often. Cases of accidental abduction (a well-intentioned but unnecessary rescue of an uninjured wild animal) were less frequent; 38.9% reported never having such cases, 22.2% rarely, 24.6% sometimes and 14.3% often. Further detailed distribution of caseload is given in Figure 3.

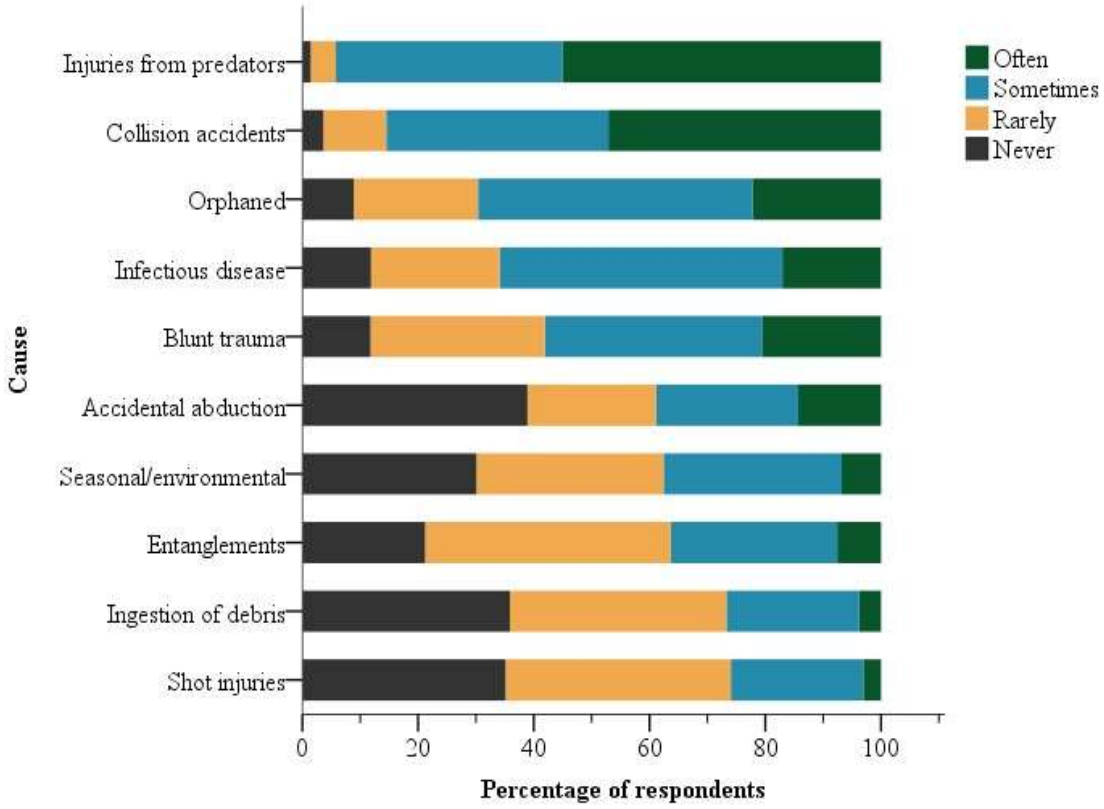

Figure 3. Frequency of causes of wildlife casualties presented to veterinary practices, as a percentage of respondents. Total responses = 138.

Members of the public often made enquiries to veterinary practices about wildlife casualties before calling wildlife charities (59.6%). Most veterinary practices had contact information for local wildlife rehabilitators (63.9%), local wildlife centres and hospitals treating multiple species (58%) or national wildlife charities (52.7%). Fewer practices had contact information for local, species specific wildlife charities (42.6%) and fewer still for national, species specific charities (26.6%). Only 3% had no contact information for any of these.

Resources

Half of the practices (50%) had not formulated SOPs that they used with regard to admitting and/or treating wildlife. A quarter of practices (24.6%) did use SOPs (others, ‘sometimes’ 18.1%, ‘don’t know’ 7.2%). The majority of practices (82.3%) did

not have an allocated budget to allow medical treatment of wildlife casualties and 9.9% of respondents were unaware if one existed.

Practices had mixed capacities for holding wildlife casualties temporarily, with 41.1% having facilities for most small animals, 31.9% for only very few or very specific, 7.8% for most small and large animals and 18.4% having none at all. There was significant correlation between total numbers of wildlife treated and the facilities of the practices ($H(4) = 20.395$, $p < 0.001$); more facilities were associated with more animals treated (J = 4,461, $z = 3.924$, $p < 0.001$, $r = 0.330$).

Knowledge within the practice about British wildlife was strongest for mammals, with only 8.5% having limited or very limited knowledge. Knowledge about reptile and amphibian species was more evenly distributed, with limited or average knowledge being reported by 30.5% and 28.4% respectively. Knowledge about aquatic and marine species was poor, with 74.8% of practices having limited or very limited knowledge. Further detailed distribution of knowledge is given in Figure 4. Knowledge over each of the 4 categories was coded (1 = very limited to 5 = excellent). From this, 'total knowledge' was calculated for each practice as the sum of the scores across each of the categories. There was a significant relationship between 'total knowledge' of British wildlife species and total animals treated ($\tau = 0.244$, BCa CI [0.142, 0.346], $p < 0.001$).

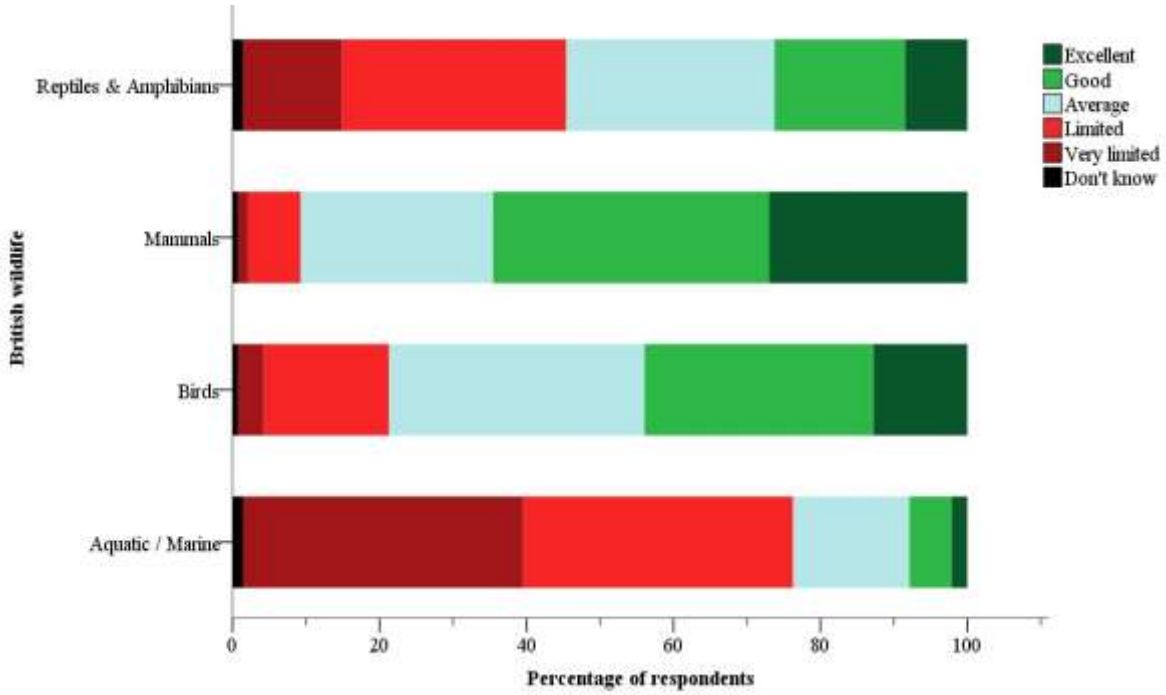

Figure 4. The level of knowledge in veterinary practices about British wildlife species, as a percentage of respondents. Total responses = 141.

Respondents were asked what restrictions the practice had experienced when treating wildlife: from those that had treated wildlife, 3.5% (5/143) had none. There was a significant negative correlation between those identifying knowledge/skills as a restriction and their 'total knowledge' score (U = 1,419, $z = -4.4$, $p < 0.001$, $r = -0.37$). Restrictions experienced by the remainder of practices are given in Figure 5.

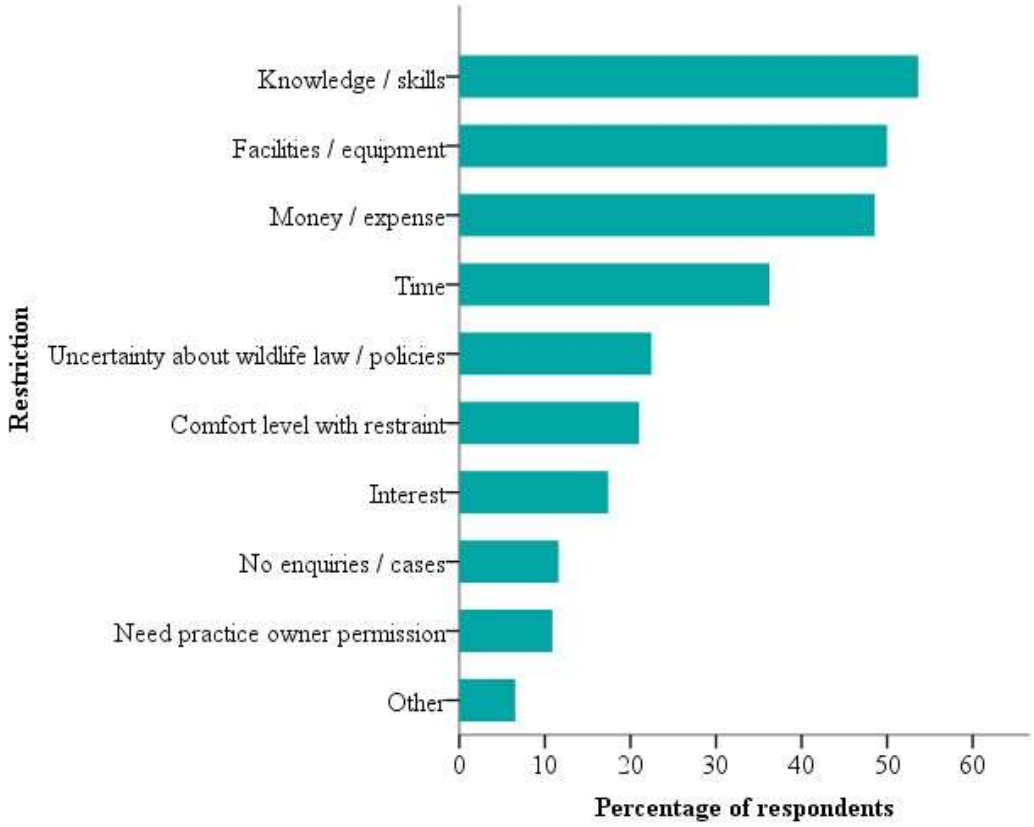

Figure 5. Percentage of restrictions experienced by veterinary practices treating wildlife. Other (in summary); prognosis always poor, lack of good post-treatment rehabilitation centres available. Total responses = 138.

The role of veterinary practices

The majority of respondents (85.6%) agreed that 'The public expects veterinary practices to treat injured wildlife for free'. A smaller majority (71%) supported the proposition that 'All veterinary practices should have a role in wild animal welfare'. There was a majority against the proposition 'It is asking too much of the profession to invest time and/or funds in treating wildlife', with 22.7% agreeing and 46.2% disagreeing. There was no significant relationship between the level of agreement with that proposition and the total numbers treated (τ = −0.022, 95% BCa CI [−0.155, 0.112], p = 0.741).

Approximately half of respondents (49.2%) agreed that 'Vet practices should share their experience of wildlife patients within the veterinary community' with only 10.6% disagreeing, yet only 1 practice reported wildlife cases (other than notifiable ones) 'often' to wildlife education, research and/or information organisations, 9.6% sometimes, 26.7% rarely and the remaining 10.4% did not know. Approximately half of the veterinary practices (52.6%) never report wildlife cases. There was no significant relationship between the attitude that practices should share their experience of wildlife patients within the veterinary community and whether or not they reported wildlife cases to wildlife education, research and/or information organisations (τ = −0.035, 95% BCa CI [−0.205, 0.141], p = 0.674).

The proposition that ‘Not much information is available on the outcomes of wildlife rehabilitation cases’ attracted broad support with 59.9% agreeing and 9.8% disagreeing. Respondents were divided over the statement ‘Vet practices play an important role in wildlife disease surveillance’, with the largest number indicating ‘neither agree nor disagree’ and around equal numbers agreeing (31%) or disagreeing (25%). Further distribution of opinions with regards to other statements are given in Figure 6.

Respondents were split over the statement that euthanasia was the most common treatment for wildlife casualties at their veterinary practice, with 33.3% disagreeing and 46.3% agreeing. Of those that admitted wildlife, most (84%) were often or sometimes willing to perform treatment beyond first aid and stabilisation (when euthanasia was not clearly indicated) before transferring the patient to a wildlife organisation. An indication of which treatments they were prepared to give is set out in Figure 7.

The opinion on whether overall, treating wildlife benefitted their practice was evenly divided, with 43.2% (57/132) responding ‘yes’ and 40.2% (53/132) responding ‘no’. There was a significant correlation between practices responding ‘yes’ and total numbers treated (τ = 0.190, 95% BCa CI [0.033, 0.323], p = 0.016). There was no significant correlation between the perception of benefits and the location of the practice (τ = 0.045, 95% BCa CI [−0.146, 0.225], p = 0.610).

Common benefit themes that arose from the open-ended answers (57 responses) included experience, knowledge, personal satisfaction, team morale and public relations. The main disadvantages (94 responses) were attributed to the diversion of resources from the practice, including staff, time and finances. Other common disadvantages were in relation to animal welfare concerns including disease transmission and inadequate facilities, equipment and knowledge to provide sufficient care. The invitation to share any comments about issues arising from the questionnaire generated 33 responses, considered in context in the discussion below.

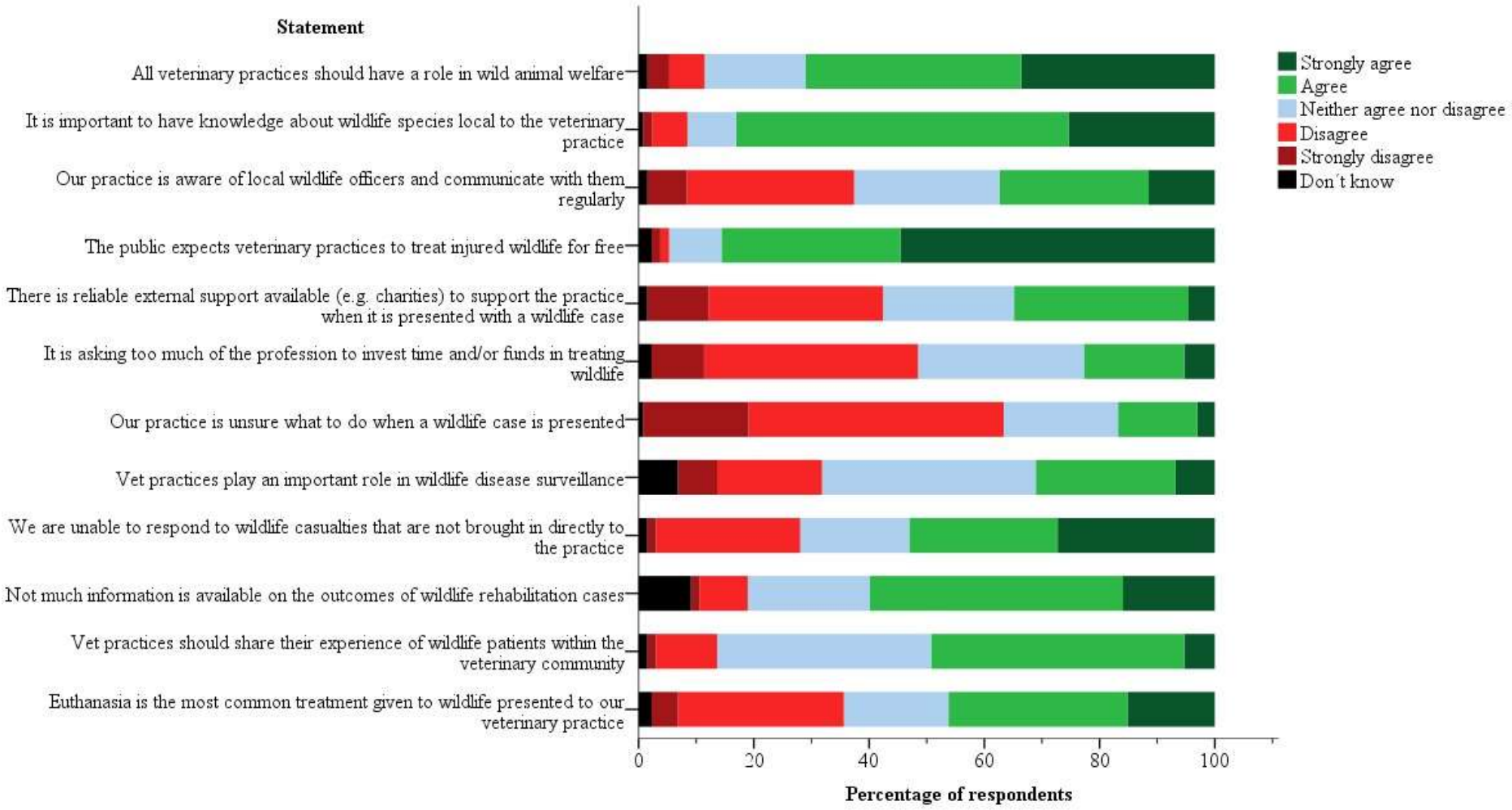

Figure 6. Frequency of responses to 12 statements of attitudes and experiences relating to wildlife in veterinary practice, as a percentage of respondents. Total responses = 135.

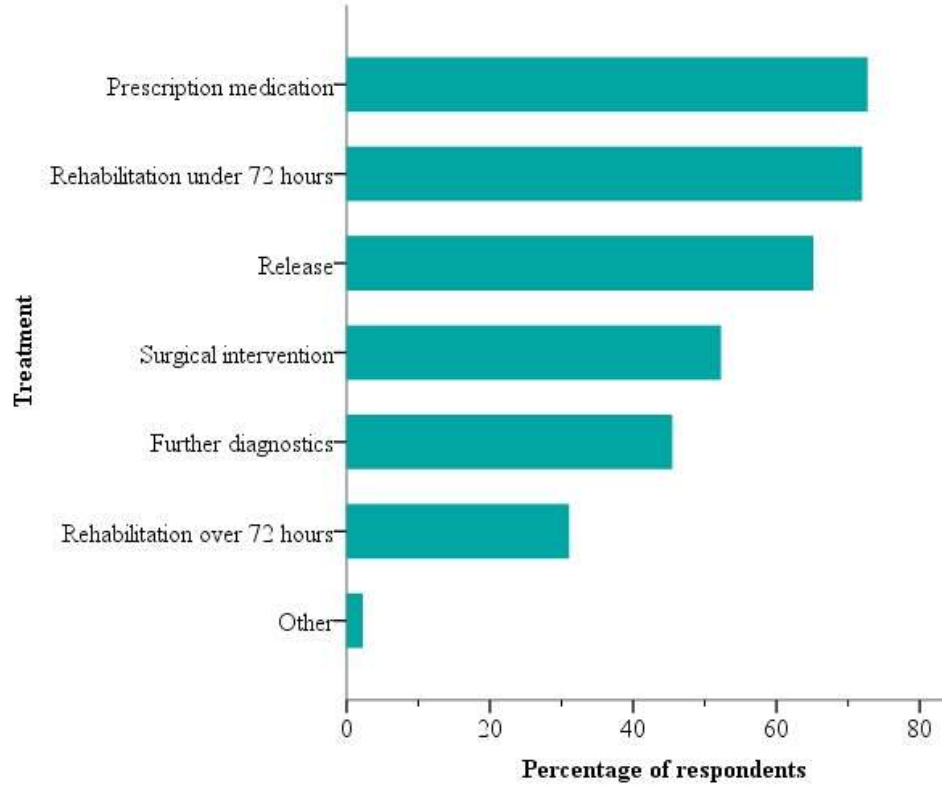

Figure 7. Treatments offered beyond first aid and stabilisation (or euthanasia) by veterinary practices admitting wildlife casualties, as a percentage of respondents. Other (in summary): transferring cases to wildlife charities. Total responses = 122.

Discussion

This was an exploratory study given the absence of previous research into the overall demand for wildlife casualty treatment from veterinary practices in the UK and their perception of responsibility and ability to meet that demand. The conclusions and correlations with practice-based variables are tentative because of its exploratory nature but may form the basis for further research.

Wildlife caseload

The survey suggests a considerable demand for wildlife casualty services from UK veterinary practices and that numbers of wildlife casualties treated may be much higher than previous estimates. The largest proportion of cases presented were garden birds and hedgehogs. The main reasons for admissions were injuries from predators and collision accidents. Other studies have shown that predation by domestic cats is common, suggesting 9 million cats in the UK killed approximately 90 million “prey items” over the spring and summer months (Woods et al. 2003), and the population of cats has since grown to 11.1 million (People's Dispensary for Sick Animals [PDSA], 2015). Increases in road networks across the UK have been implicated as increasing collision accidents involving wildlife (Ward et al. 2015) and road traffic accidents are commonly cited as reasons for admissions (predominantly mammals) elsewhere in the literature (e.g., Cousquer 2005; Bexton and Couper 2010). More surprising was the lower levels of accidental abduction reported. Animal

charities regularly report they receive overwhelming numbers of fledgling birds from the public, unnecessarily 'rescued'. It appears that this problem may be less frequent for veterinary practices.

Nevertheless, there may be scope for public education to reduce the demand on veterinary practices. In the open answers national charities were criticised by some for encouraging unrealistic expectations when directing the public to bring any injured wildlife to any local veterinary practice. Others commented that expectations as to the nature of the treatment that should be provided were unrealistic. Comments included 'welfare is paramount, euthanasia can be a welfare option and we never refuse to see an animal. However…self-righteous woolly thinking about wildlife is rife…' and 'the public expectation that vets will pull out all the stops to treat a wildlife case is unrealistic and should not be propagated by the often irresponsible actions of charitable do-gooders'. Another stated 'our issues are with single species groups who will apply as much pressure as they can to save every single animal irrespective of cost to the practice, even when the species is a common one and the UK population is in no danger'.

Resources

The costs of treating wildlife casualties (including expenses and time) in a veterinary practice were among the main constraints reported, and also featured largely in the open answers. The MoU offers reimbursement for initial emergency treatment for large animals (over 1kg), but that excludes the majority of the caseload identified in this study by size alone. Furthermore, the majority of practices reported members of the public called the practice before contacting other wildlife charities, which also precludes reimbursement under the MoU. Some practices were happy to balance these costs, others were not. The response to the statement 'it is asking too much of the profession to invest time and/or funds in treating wildlife' was divided. Hutchinson et al. (2013) suggested there is increasing pressure on veterinary practices to charge members of the public presenting wildlife. However, a great majority (77%) of respondents in this survey agreed that 'the public expects veterinary practices to treat injured wildlife for free', therefore obtaining funds from them may be difficult and potentially damaging for public relations. Veterinary practices may need additional support systems in place to make treating wildlife more viable if they are to be part of wildlife casualty management.

Most respondents agreed that it is important to have knowledge about wildlife species local to the veterinary practice, but knowledge/skills was the largest single restriction reported (by over 50% of respondents). Practices reported a good overall knowledge of British wild bird and mammal species, which is consistent with the caseload. There was a lower level of knowledge in aquatics/marine and reptiles and amphibian species. A study in New Zealand showed that many veterinarians perceived they had inadequate knowledge of the management of pain in species that formed a small part of their caseload (Keown et al. 2011). This may be because knowledge comes with experience, or because veterinary practices are reluctant to treat where they have limited knowledge. In the present study, there was a clear correlation between practices that did not have good total knowledge and those recognising that the lack of knowledge/skills was a constraint in treating wildlife.

There was a positive correlation between the holding facilities reported and the total numbers treated. While practices reported good facilities to hold small wildlife they

also acknowledged being limited by lack of (presumably other) facilities/equipment. This was the second most reported restriction (by about 50% of respondents). The open answers identified the need for suitable accommodation to provide a stress free environment, the lack of appropriate nutrition and the risk of disease transmission. Veterinary practices with higher numbers of veterinary surgeons and nurses also tended to treat more wildlife. This could be because they had more time available collectively to treat wildlife casualties, or perhaps larger practices were more likely to have individuals with the skills and interest to treat wildlife. The relative importance of these practice variables will need to be verified with further investigation.

The majority of practices were prepared to offer prescription medication and rehabilitation under 72 hours; fewer would offer further treatment or longer rehabilitation. Considering the animals that need further rehabilitation, it is encouraging that most veterinary practices had contact information for local wildlife rehabilitators, or centres and national wildlife charities. There was an even split about the reliability of support from these charities, one respondent commented that once an animal is in the care of a veterinary practice, charities are not interested in taking them for rehabilitation.

Few practices used wildlife SOPs consistently. Wildlife rehabilitation literature suggests it is important to have applicable decision support systems (such as species specific protocols) in place to limit hesitation with wildlife casualties, benefitting staff and animal welfare (Cooper 2003; Stocker 2005). Greater implementation of SOPs may improve the ability of veterinary practices to respond to the wildlife casualty demand. In practices unwilling to offer further treatment, SOPs could be used to divert wildlife cases more effectively.

Attitudes

The survey broadly supports the public perception that veterinary practices are willing to deal with wildlife. Harvey (2010) suggested a moral obligation to accept wildlife from members of the public. The term ‘obligation’ was not mentioned in open answers but whether morally obliged or not, veterinary practices clearly regard themselves as having some responsibility for wildlife casualties. The fact that 84% of practices were willing to treat wildlife patients beyond first aid and stabilisation is a measure of the profession’s commitment to wildlife rehabilitation.

Veterinary practices that believed that treating wildlife benefitted their practice also treated higher numbers. It is likely there is a bi-directional relationship here. The openended answers on the benefits showed that many veterinary professionals enjoyed the challenges of treating wild animals, were motivated by gaining new experiences and often cited it as giving a sense of wellbeing, enhancing job satisfaction and team morale. Some saw it as a contribution to the local community, and others mentioned potential good publicity for the practice. However, some respondents expressed doubts about the quality of such treatment, and the impact on animal welfare, citing low success rates/high mortality. The responses that expressed less willingness often did so in strong terms. Apart from the concern about the diversion of resources from the core business, comments included ‘Goes against the belief that it is not our place to interfere with the natural world’ and ‘If I never treated another bloody pigeon half eaten by a cat, I really wouldn’t miss them!’. Practices with these attitudes should perhaps have policies in place to divert wildlife cases appropriately.

The England Wildlife Health Strategy (EWHS) emphasises the importance of national veterinary professional collaboration in wildlife disease surveillance (Hartley and Lysons 2011) and this extends beyond notifiable diseases. Respondents to the questionnaire were less sure of the importance of this role and very few reported nonnotifiable diseases, which suggests that, despite the EWHS, veterinary practices are not currently considerably involved.

The statement 'Not much information is available on the outcomes of wildlife rehabilitation cases' was widely supported. Combined with the reporting of knowledge as a main restriction suggests that veterinary practices would benefit from feedback from rehabilitators and charities. Broader sharing of wildlife experiences within the veterinary community could also be valuable. The respondents generally supported the idea that information on wildlife cases should be shared, but few actually took steps to do so. Vandeweerd et al. (2012) found that veterinary practitioners consulted less formal sources on the internet rather than scientific databases and peer-reviewed literature, mainly because of limited time. To facilitate sharing of wildlife experiences, it could be useful to establish an online forum open to contributions from the profession.

Limitations

Limitations of this study include the snapshot nature of the cross-sectional design. The study may have limited generalizability because of the relatively small sample size and may be unrepresentative of the national population. The useable response rate was 10% (n = 169), this equates to 3% of the total number of registered veterinary practices in the UK at the time of research (n = 5,125). Therefore, findings need to be interpreted with caution. There is also a degree of self-section bias and social desirability bias attached with self-administered questionnaires. In addition, the study's findings are based on a new questionnaire developed especially for the purpose which is likely to need further refinement and testing.

Management implications

This exploratory survey raises issues for further consideration and research. The study suggests veterinary practices recognize and accept their responsibility to treat wildlife casualties. Further attitudinal research could test whether the opinions expressed by our sample are representative of the population. More research is needed to assess how the various benefits and disadvantages identified impact on the management of wildlife casualties in veterinary practices.

The study shows the number of wildlife casualties treated may be significantly higher than previous estimates. A more reliable assessment of these figures is needed, to assess the capacity and contribution of veterinary practices to wildlife casualty management. This should include the species involved and the causes of injury, preferably taken directly from clinical records. Finally, further studies could assess how the main concerns identified (knowledge/skills, facilities/equipment, money, time) affect capability and how far these impact on treatment and animal welfare.

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